

塑造智慧变革



HEXAGON

海克斯康



北京
国家会议中心

2018年
9月10-12日

2018.hexagonchina.com.cn

Mobile Mapping Product Line

全能家族——徕卡新一代移动激光扫描系统家族介绍

Alessandro Nuzzo – Product Line Manager Mobile Mapping/
移动测量产品经理

2018, September 11th

World Population 7.5 Billion and Counting 全世界人口75亿

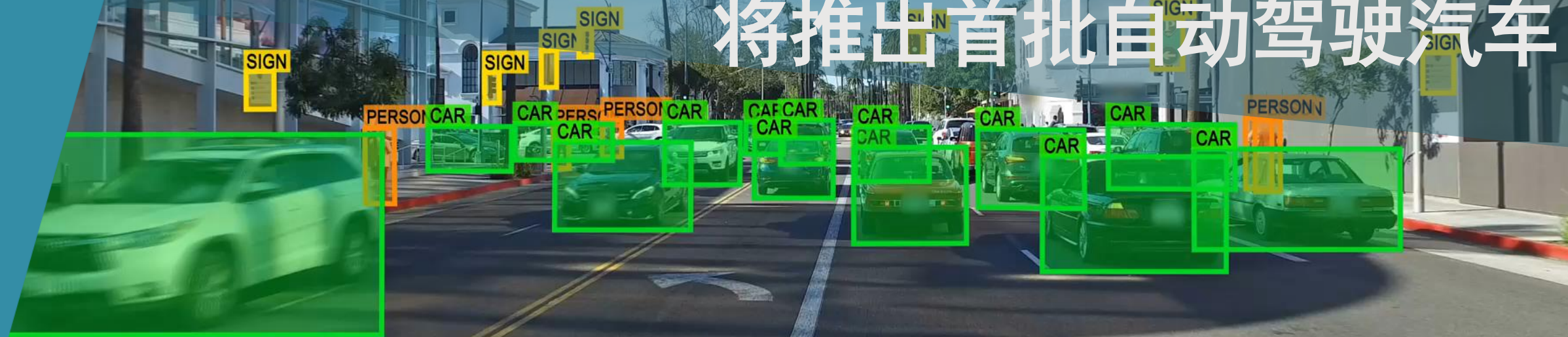
An aerial photograph of a dense urban environment, featuring a complex multi-level highway interchange with several lanes of traffic. The surrounding area is filled with various buildings, including residential and commercial structures. The image is overlaid with a semi-transparent dark blue banner containing text in English and Chinese. The bottom left corner of the image has a green triangular graphic element.

**3 million People move
to Cities each Week**
每周有300万人口迁移到城市

90% of all Data in the World
was created in the last 3 yrs
世界上90%的数据是在过去三年
中创造出来的

Car OEMs announced first Autonomous Vehicles for 2023

汽车生产厂商们宣布在2023年 将推出首批自动驾驶汽车



Data Ownership is the new Oil

掌握数据就是掌握新的“石油”



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- Topography X,Y,Z/地形
- Topology/拓扑结构
- Database completeness
数据库完整性
- Information obsolescence
数据老旧



Speed of Change/变革速度

- After decades spent to map, now we have to control *dynamic realities*
- The data collection and processing must be faster than the speed of changes of the reality
- **Accuracy** is referred to accurate information, *not just and only X,Y,Z....* a slow system cannot be accurate
- 随着测图的发展，现如今更关注地图的动态更新
- 数据采集和处理的速度必须要快于现实世界的变化
- 精度代表准确的信息，不仅仅是坐标精确，缓慢的更新不可能准确



Pegasus:Two

- Vehicle independent System
- Asset Management
- Road Analysis
- Rail Infrastructure Survey
- Survey Grade Accuracy
- 不限定载具
- 资产管理
- 道路分析
- 铁路基础设施测绘
- 高精度测绘



ADA SIDEWALK RAMP

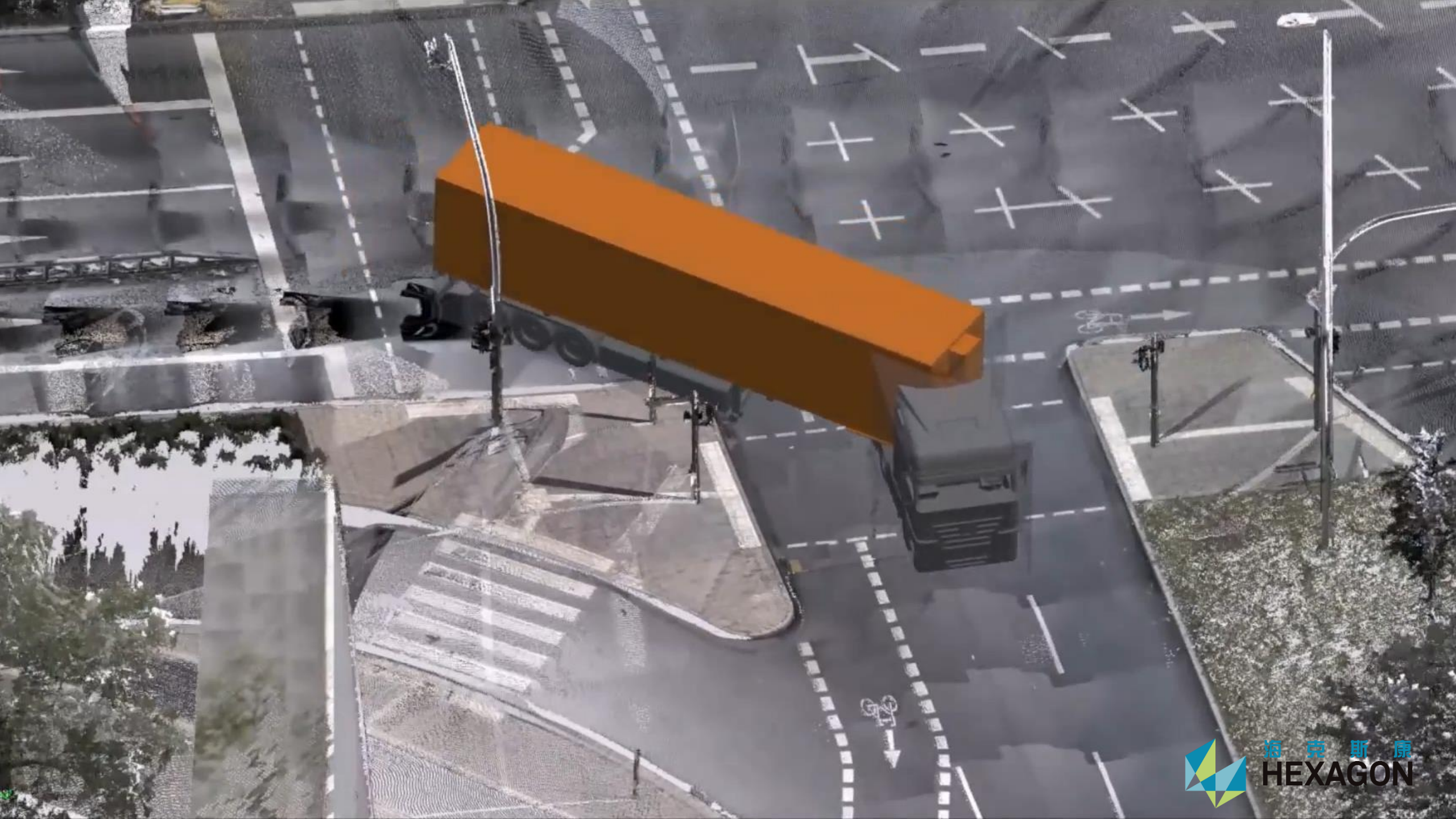
MANHOLE

MANHOLE
MANHOLE

MANHOLE
MANHOLE

PARKING METER

PARKING METER



Boat Application

船载扫描应用

- Damage Inspections
- Deformation Analysis
- Coastal Erosion
- Harbour inspection
- 桥梁损伤检查
- 变形分析
- 海岸侵蚀
- 港口检测





Rail Application/铁路扫描应用

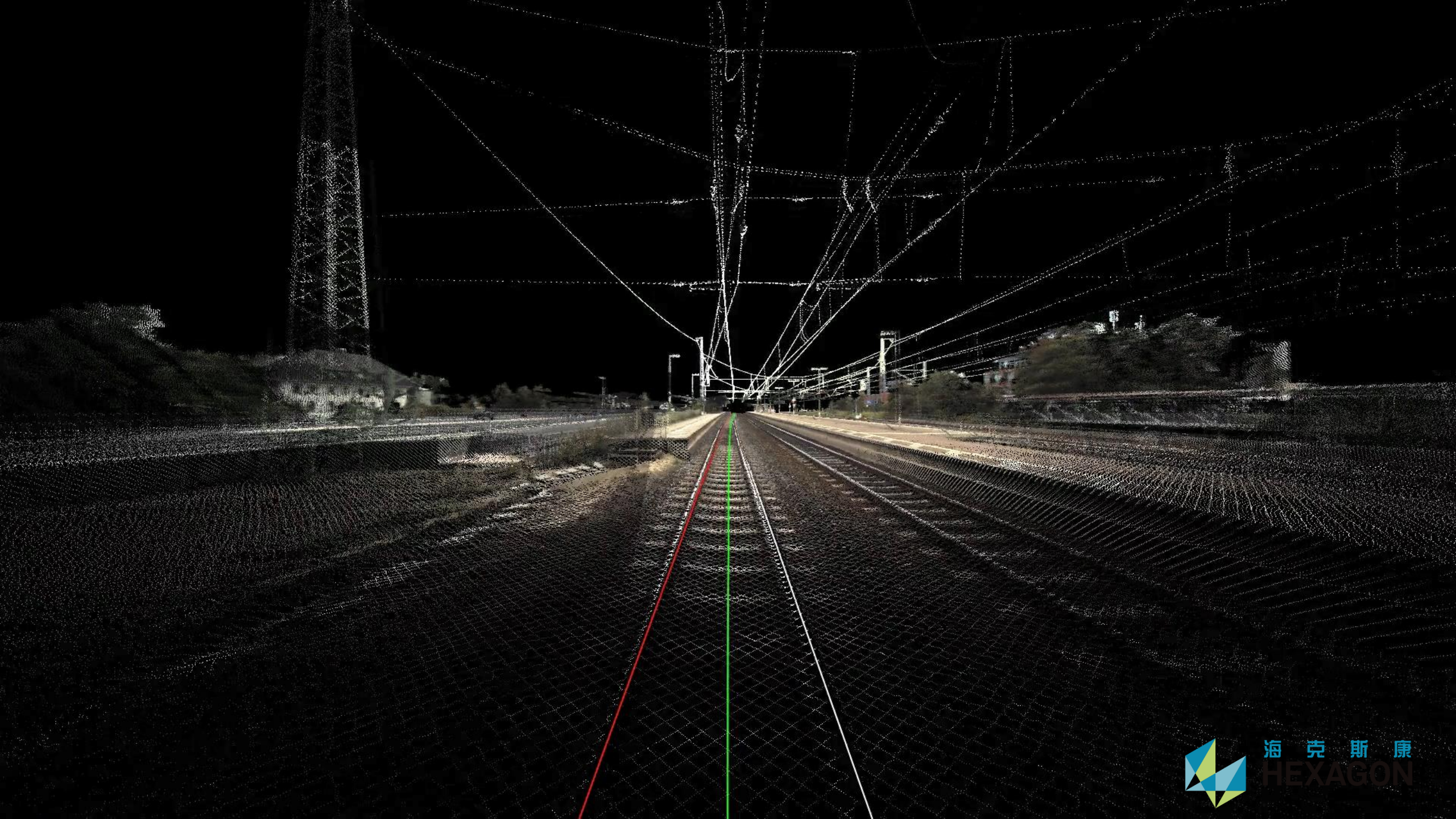
Leica Pegasus:Two

Sensor Platform to combine Ground Penetrating Radar and Thermal Imagery

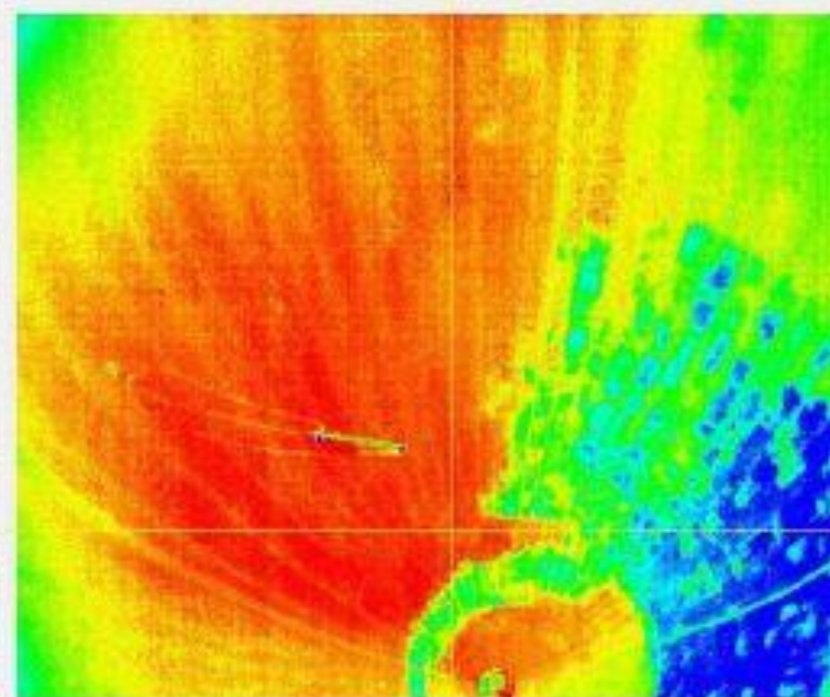
徕卡Pegasus:Two结合探地雷达和热成像相机

- Clearances
- Asset / GIS / PTC Mapping
- Track Geometry
- Change Detection
- Catenary Mapping
- Vegetation Mapping
- 净空分析
- 资产/GIS/PTC测图
- 轨道结构
- 变化检测
- 接触网测量
- 植被测量





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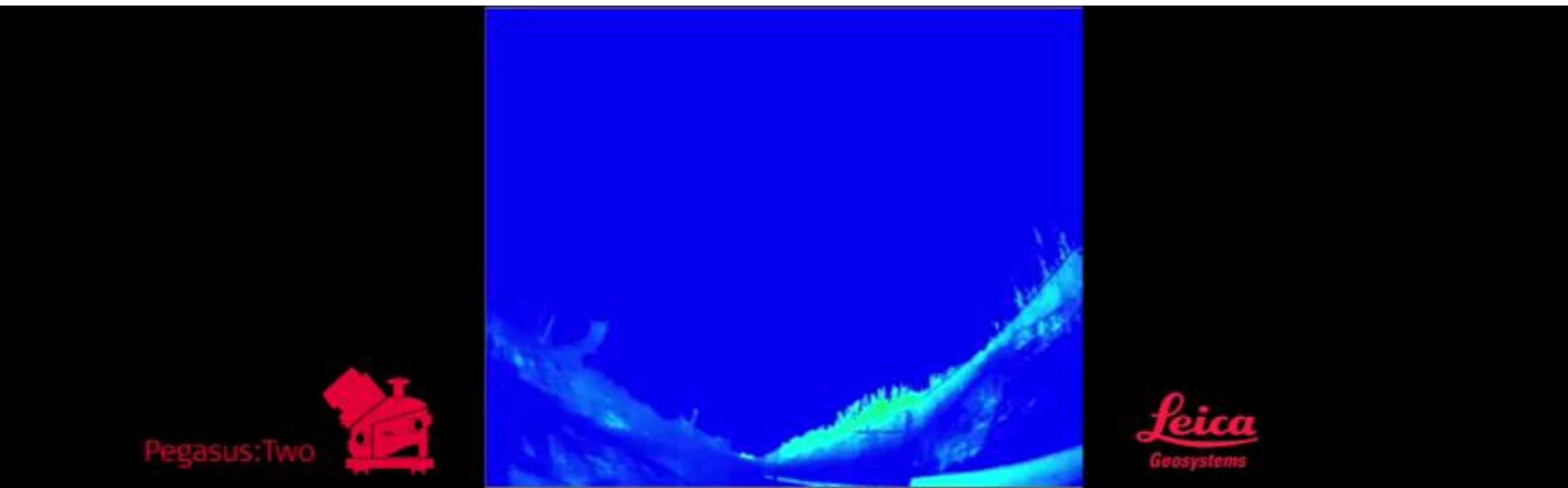
Zoom 100%

Thermal image

Temperature $^{\circ}\text{C}$

Pegasus:Two and Thermal Imagery

徠卡Pegasus:Two热成像系统



Pegasus:Stream

- Below and Above Ground
- Asset Management
- Buried Objects
- Cavities Detection
- Massive Data Capturing
- 地上地下测量
- 城市资产管理
- 掩埋物检测
- 空洞检测
- 海量数据采集







HEXAGON

CITY DIGITISATION FOR AUTONOMOUS VEHICLE REFERENCE BASE MAPS

城市道路数字化基础地
图用于车辆自动驾驶





Reality Capture 现实捕捉

World Wide Road
Digitalisation

全世界的道路数字化



OpenDrive

Intersection in OpenDrive
including complete object
information

集成在OpenDrive中，包括
完成的对象信息



80% of our Living Space
is Indoor

80%的生活空间集中在室内

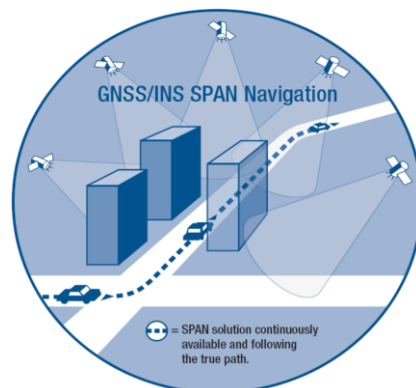
**60% of today's Buildings
will still be in use in 2050**
到2050年，今天60%的建筑仍将继续使用

New positioning methods are needed

我们需要全新的定位方式

GNSS/INS Navigation

GNSS/INS 导航



Satellite based positioning systems is the backbone of all mobile mapping

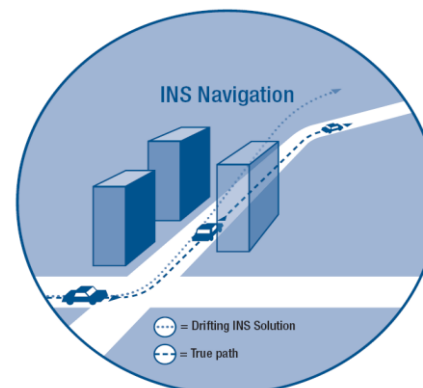
Requires a direct line-of-site to the satellites

Need Orientation information

所有移动测量必须接收足够的卫星才能定位，而且需要定向信息

INS Navigation

INS 导航

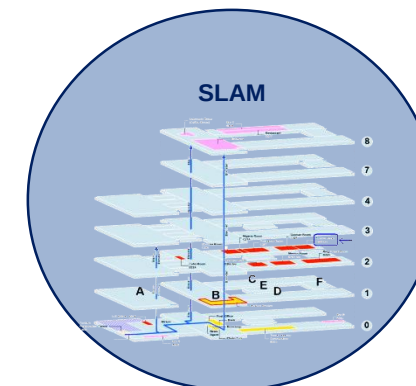


Adding an Inertial Navigation System allows us to determine orientation and navigate without access to satellite signals

有了惯导系统能够帮助我们在无法通过卫星信号定位的地方进行定向和导航

SLAM Navigation

SLAM 导航



A method of measuring the environment and determining a location in that environment at the same time

一种能够在测量周边环境的同时进行实时定位的技术

Outdoor 室外



Indoor 室内

SLAM Technology

SLAM技术

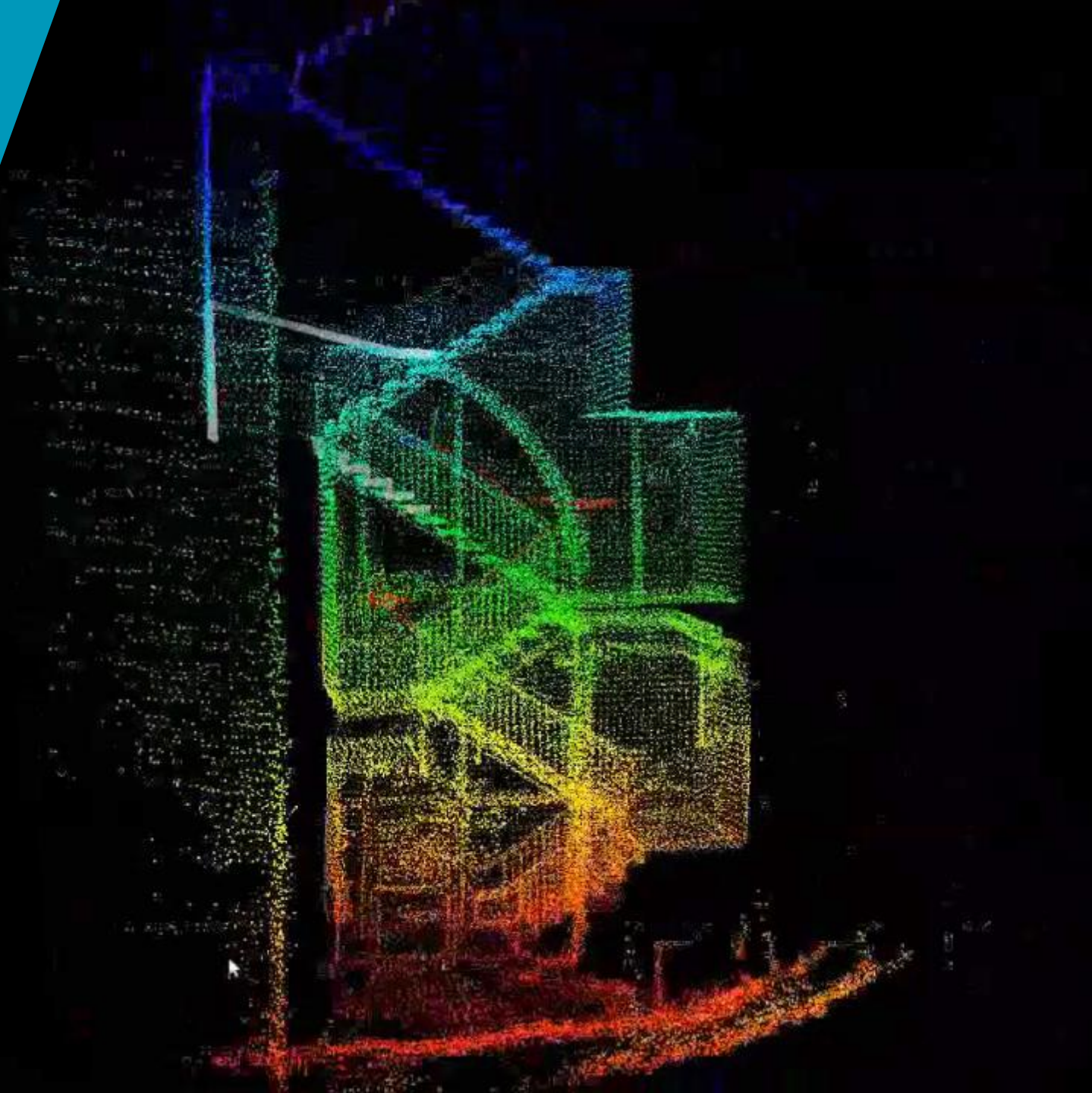
Simultaneous Location And Mapping
实时定位与测图

A method of measuring the environment and determining a location in that environment at the same time

- SLAM allows us to measure an arbitrary environment
- No spatial context

一种能够在测量周边环境的同时进行实时定位的技术

- SLAM能帮助我们测量任意环境
- 不受空间限制



Pegasus:Backpack

- Wearable Ultra Light System
- Indoor & Outdoor Survey
- Asset Management
- BIM Documentation
- Disaster Recovery
- 可穿戴轻便扫描系统
- 室内室外测量
- 资产管理
- BIM建档
- 灾害复原





An aerial photograph of a large, modern industrial facility, the BMW plant in San Luis Potosi, Mexico. The main building is a massive, rectangular structure with a light-colored, flat roof featuring a grid of small, dark, square skylights. The building is surrounded by a dirt area with some construction equipment and materials. In the background, other industrial buildings and a parking lot filled with cars are visible under a clear sky.

Bayerische Motoren Werke AG (BMW) plant, San Luis Potosi, Mexico



Laramie-Poudre Tunnel entrance



Baron

4.725 million passenger journeys
were recorded in one day in London
在伦敦每天将记录47.25亿次旅客行程

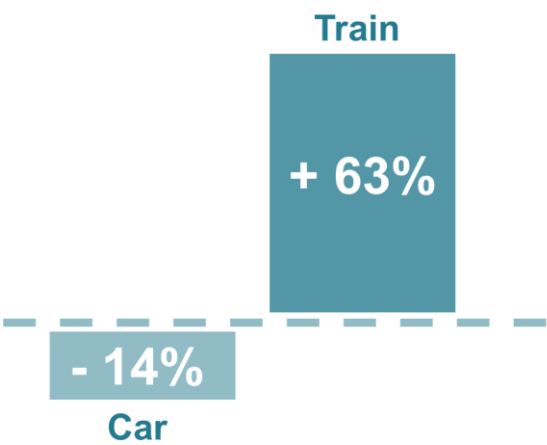


Transportation Competition 交通竞争



Driving gets cheaper (1980 / 2014)

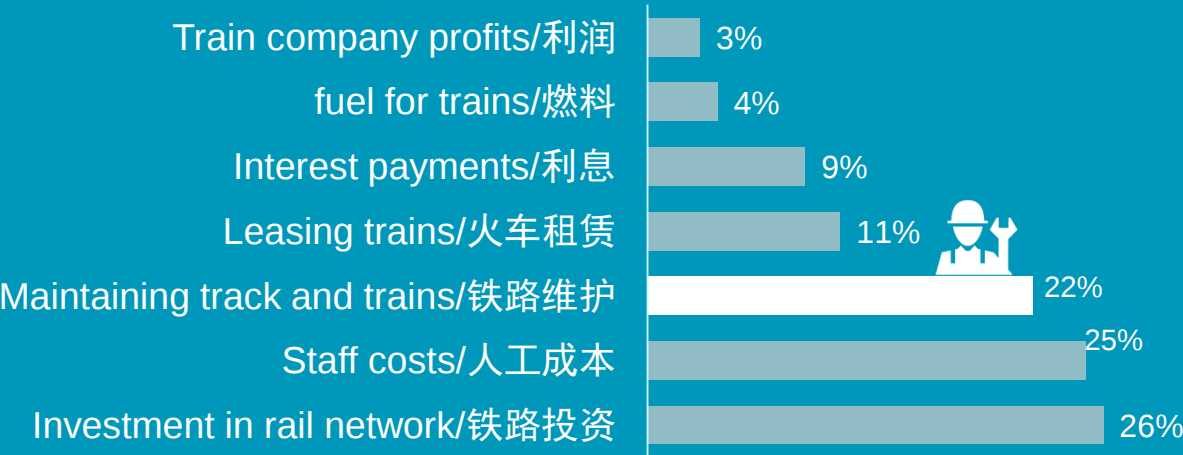
开车更便宜(1980 / 2014)



Source: Independent



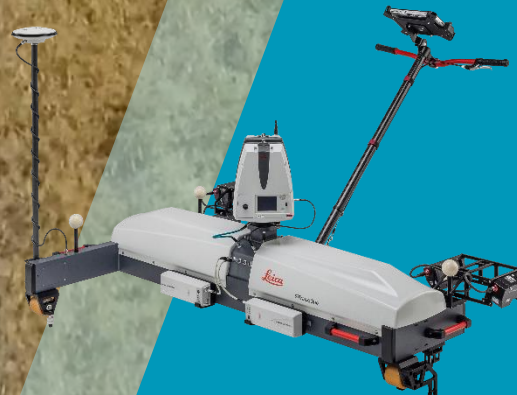
Rail ticket price brakedown 轨道交通票价降低



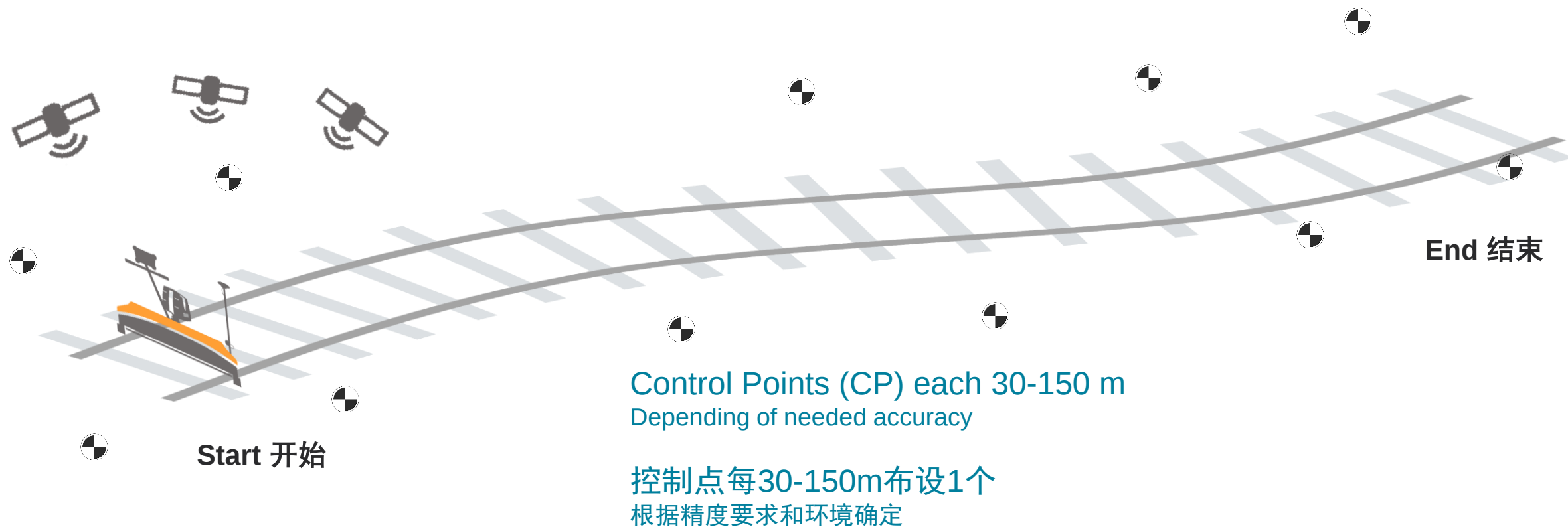
An aerial photograph of a railway track. A worker in an orange safety vest is standing on the gravel bed between the tracks, holding a device. A white sensor unit is mounted on the track. The background is a grassy field.

SiTrack:One

- Fast As-built Rail 3D Capture
- Determination Track-Geometry
- Tunnel Deformation Analysis
- Designed to as-built structure
- Rail Wear Calculation
- 快速铁路竣工三维数据获取
- 铁轨检测
- 隧道变形分析
- 竣工结构分析
- 铁轨磨损估算

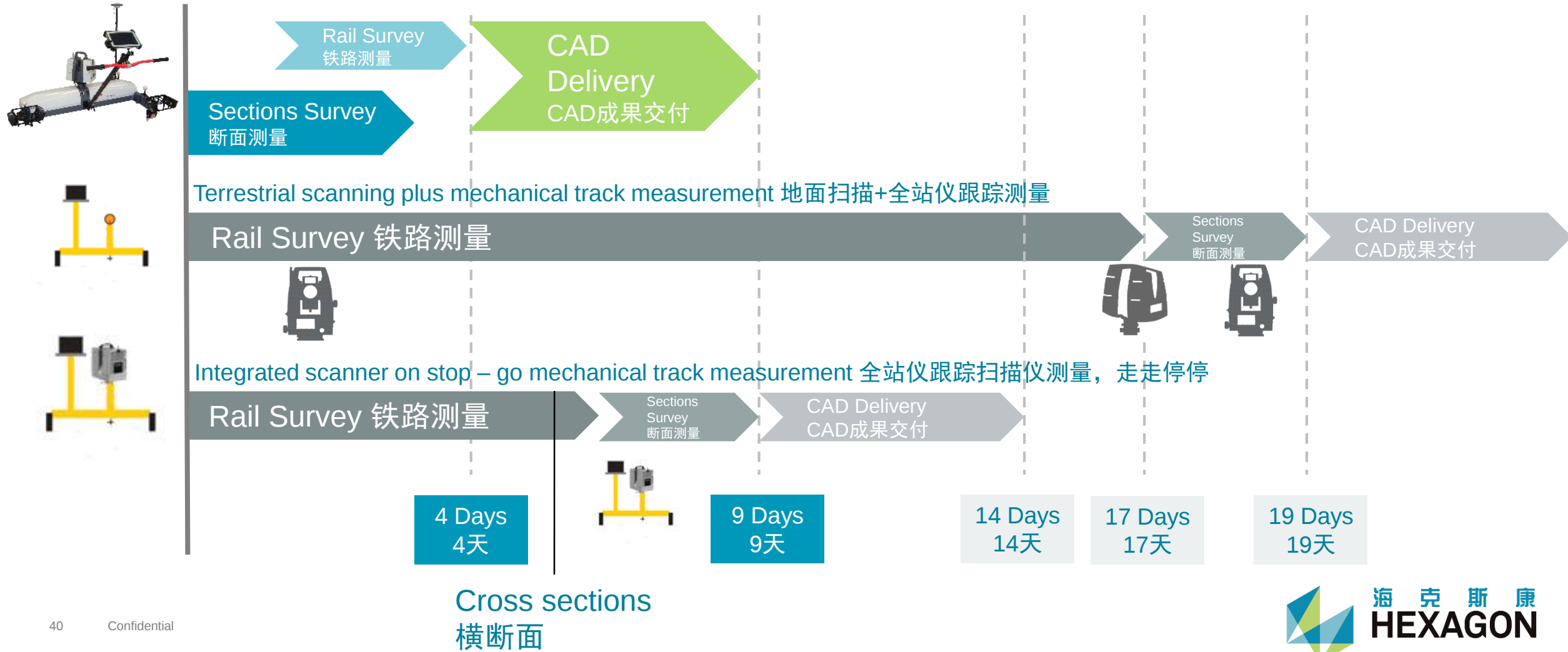


Workflow - 3D Capture - Using GNSS and/or Control Points 三维数据采集工作流程——使用GNSS和控制点或只用控制点



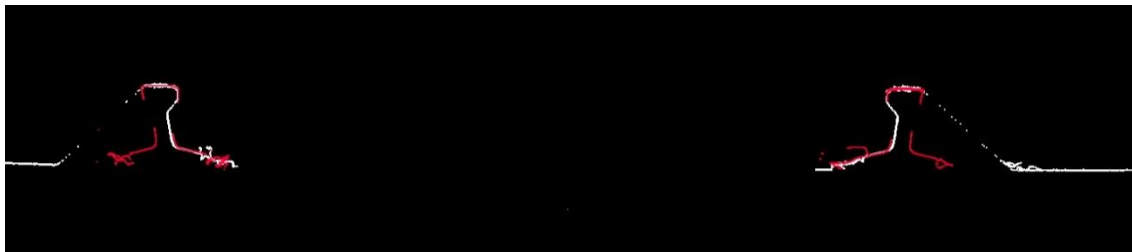
Workflow Comparison – 4Km Tunnel Survey

工作流程对比——4公里隧道测量为例



Railway Tasks – New Feature - Rail-Wear-Calculation

铁轨测量——铁轨磨损估算



- High resolution rails point cloud
- Rail profile scanners – high-end technology (1000Hz)
- Automated rail information export

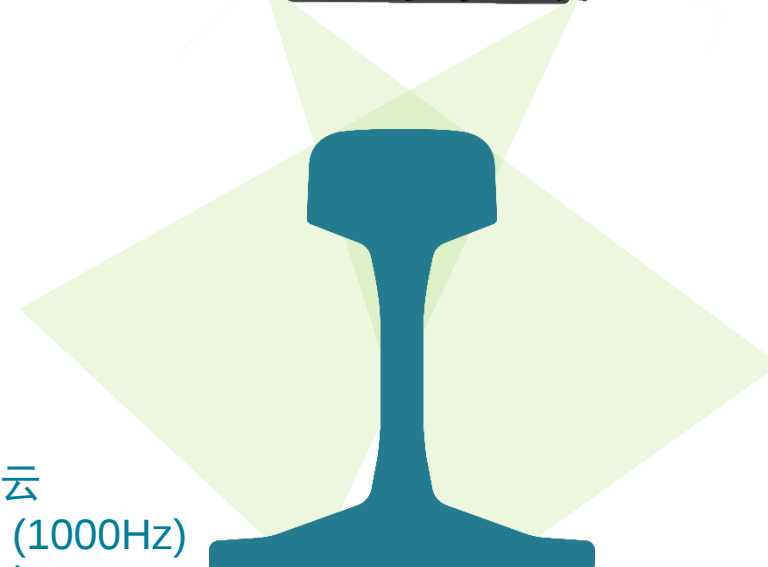
Configurations:

- 2 Scanner Heads
- 4 Scanner Heads

配置

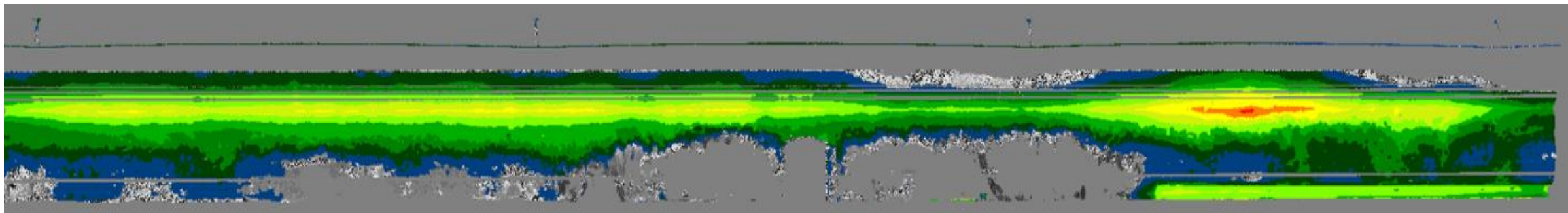
- 2个扫描头
- 4个扫描头

- 高分辨率铁轨点云
- 铁轨剖面扫描仪 (1000Hz)
- 自动导出铁轨信息



SiRail Suite

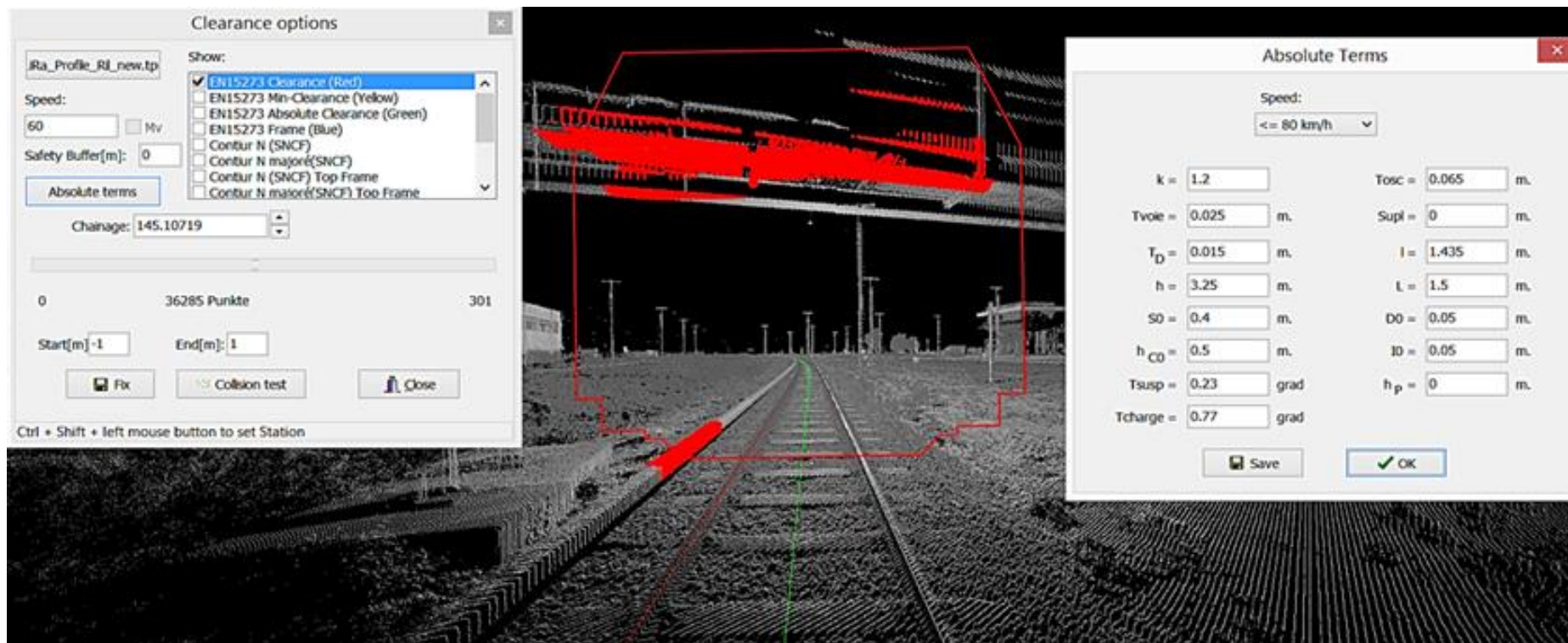
SiRail软件解决方案



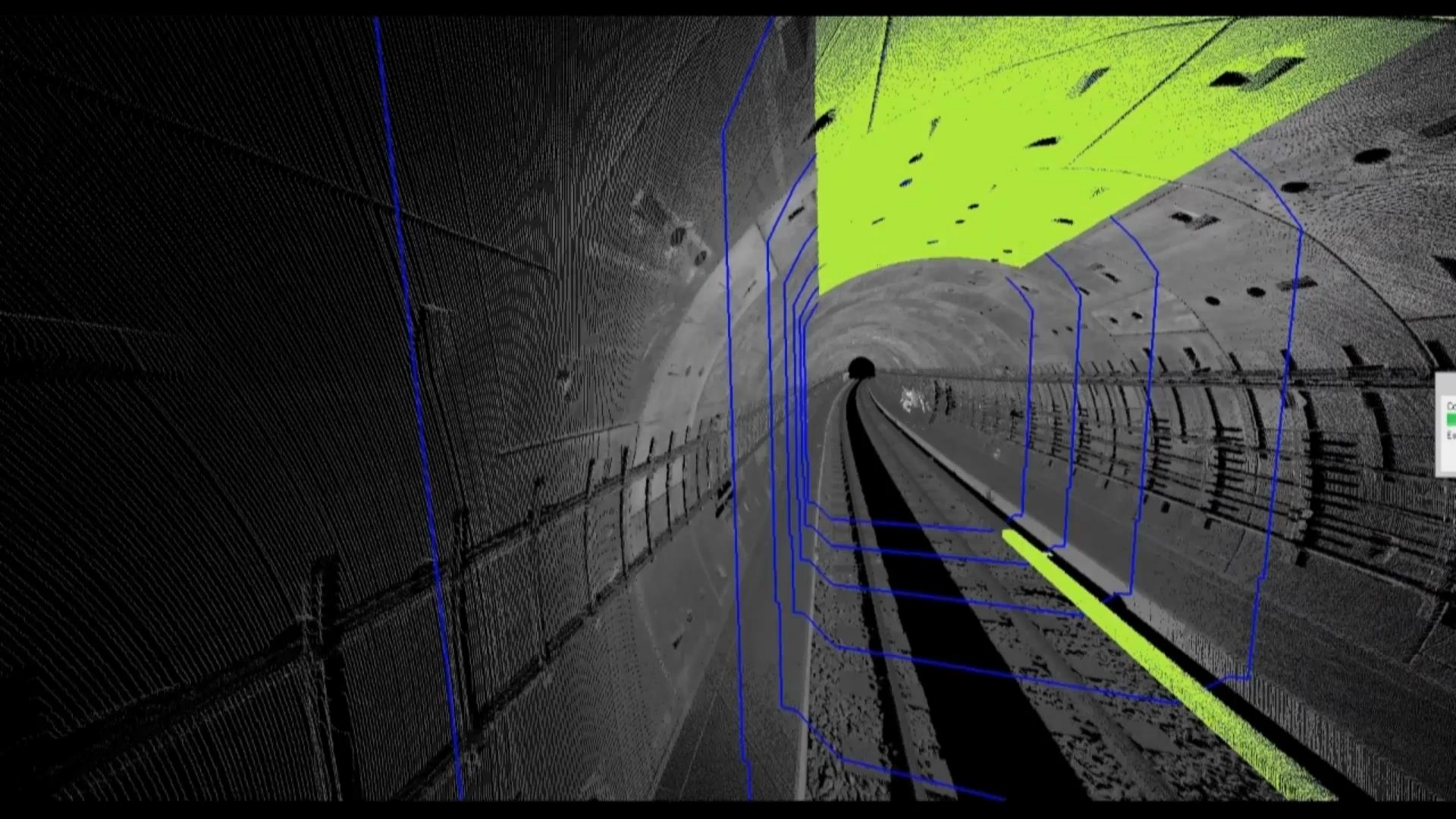
- Batch tunnel deformation analysis
- Automated calculation of differences “designed to as-built structure”
- Batch extraction and adjustment of the as-built rails
- 批量隧道变形分析
- 自动计算与设计竣工结构的偏差
- 批量提取和调整轨道线

SiRail Suite

SiRail软件解决方案

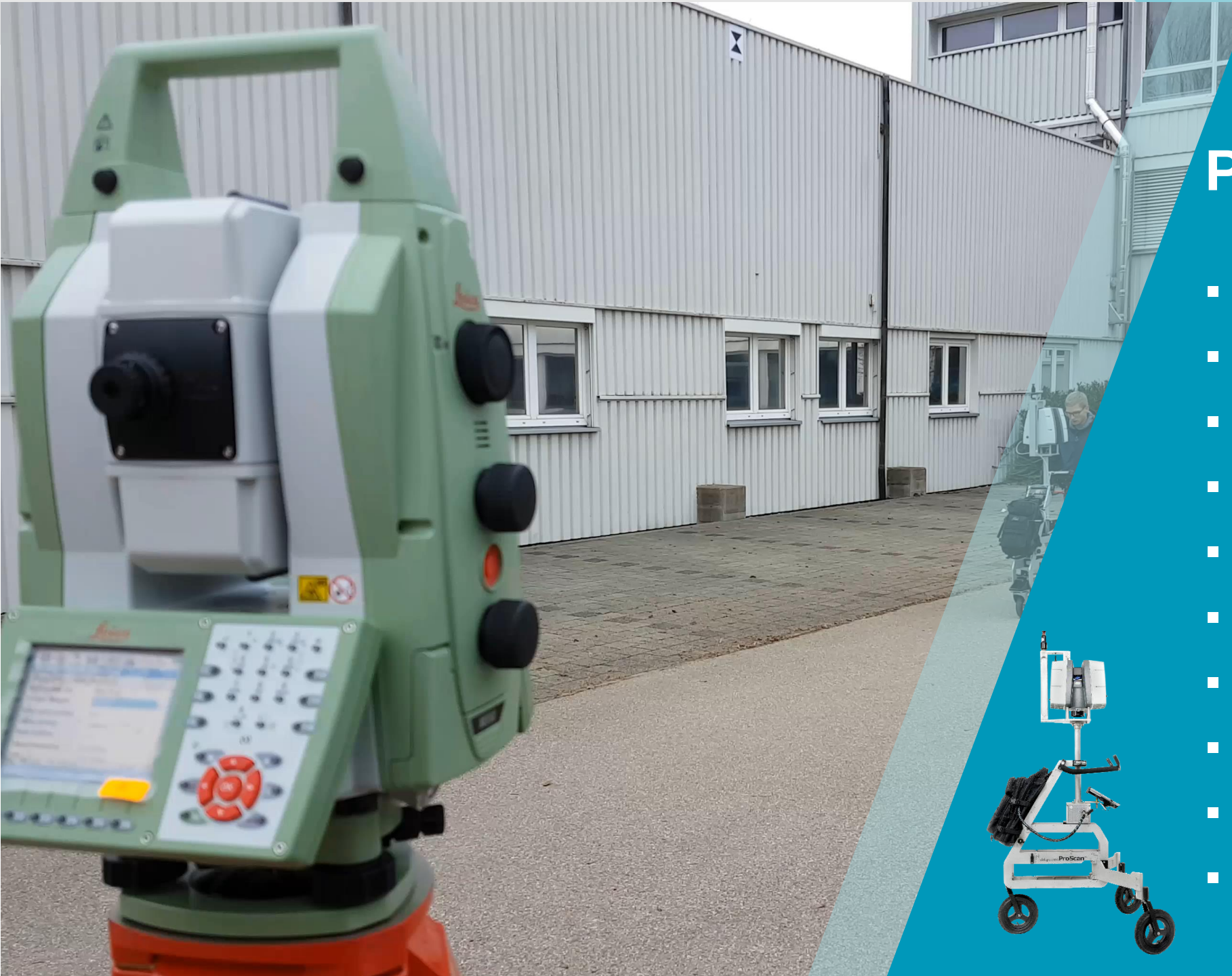


- 2D Clearance-analysis (static, dynamic): Exact determination of clearance infringements
- Based on European rules and individual Formulas (for example for SNCF - National French Railway Company)
- Calculation of potential clashes also between neighborhood tracks
- 2D净空分析（静态，动态）：准确的侵界检测
- 基于欧洲铁路规范和个人定制化格式
- 碰撞分析，适用于相邻铁轨



A close-up photograph of a yellow road roller drum. The drum is painted bright yellow and features various mechanical components, including a central grey hub, a black rubber tire, and several metal bolts and brackets. The background shows a gravel surface and some green foliage.

**Traffic Congestion costs \$63.70
per every hour a Trucker drives
卡车司机每小时的交通拥堵成本是63.7美元**

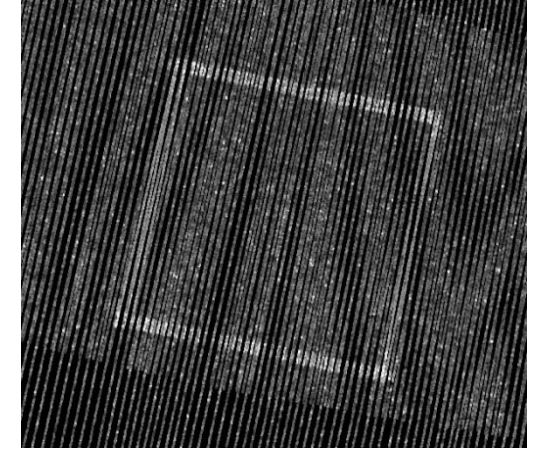
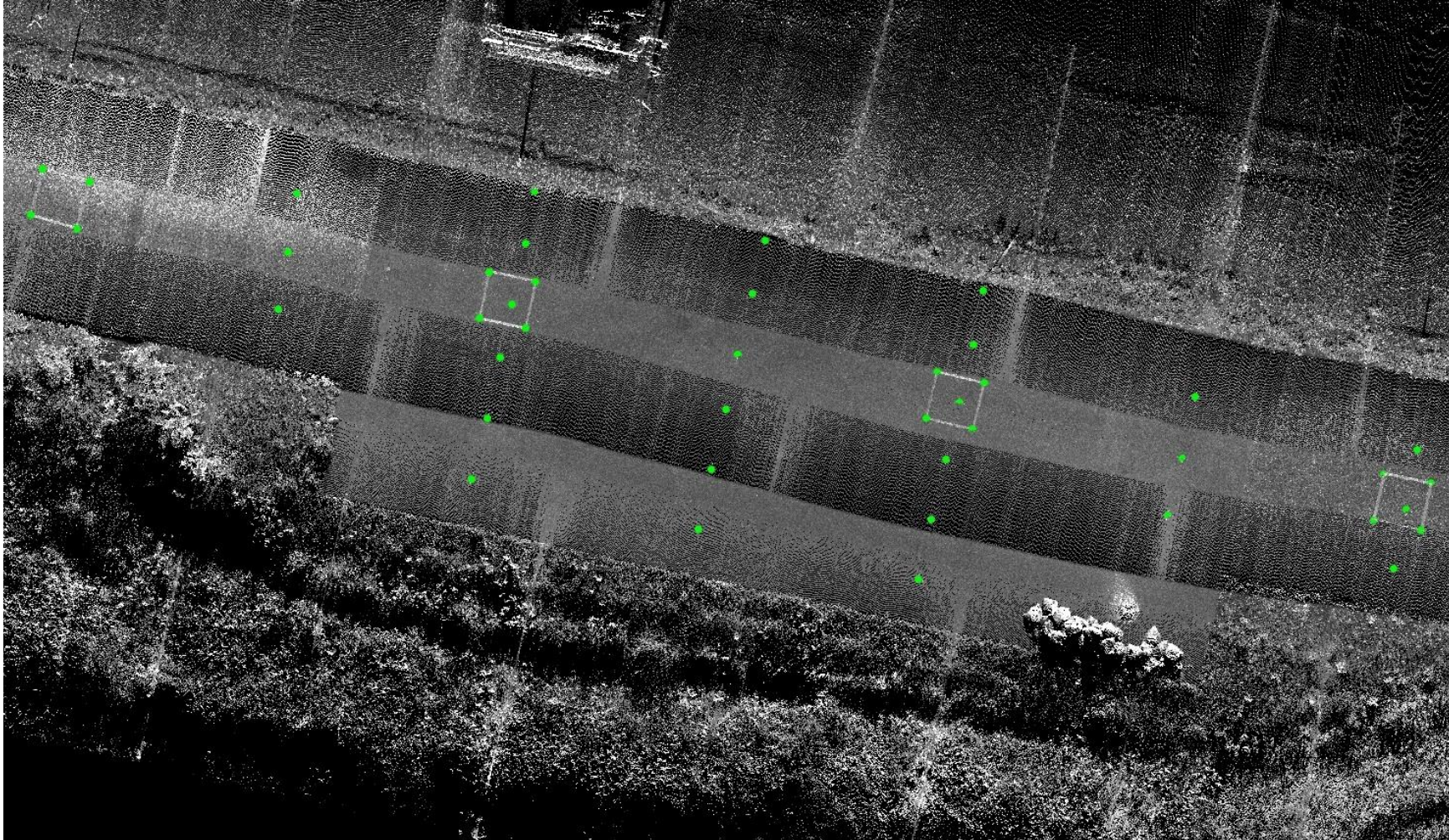


ProScan

- Kinematic Scanning
- TPS and GNSS Positioning
- Asphalt Thickness Layer
- Tunnel Deformation
- Ground Elevation Map
- 移动扫描
- TPS和GNSS两种定位方式
- 沥青层厚度检测
- 隧道变形
- 地面高程测量

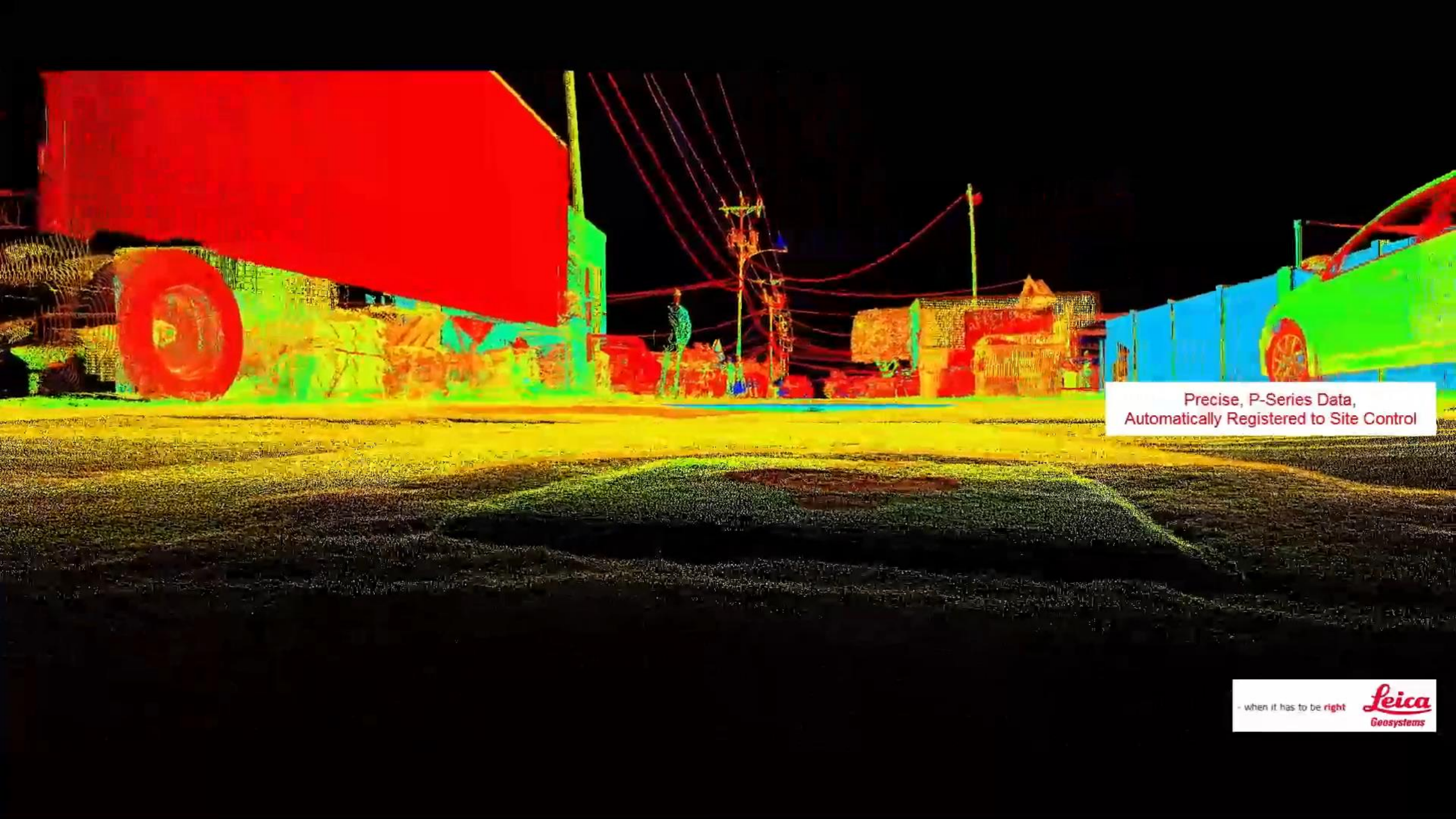


Paved Surface Point Density 铺砌表面的点密度



More than 60K points in a
1x1m square
每平方米高达6万点





Precise, P-Series Data,
Automatically Registered to Site Control

Applications: Tunnel 隧道应用案例



Kinematic Laser Scanning:

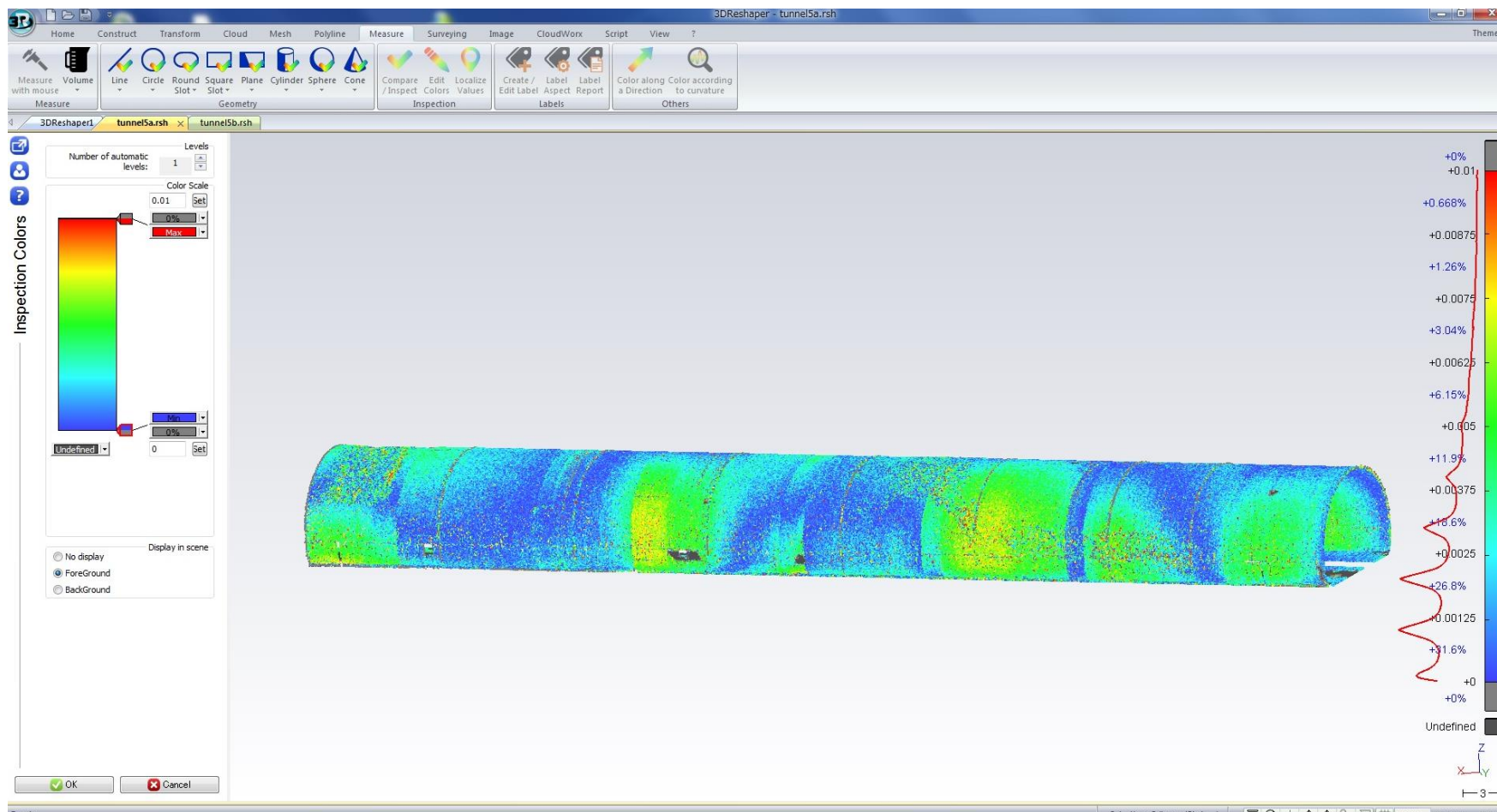
- 102 Million Points
- Data Captured in 27 Minutes
- Data Processed in 30 Minutes
- Length of Trajectory 212 m
- Resolution 6 mm

移动激光扫描:

- 高达1.02亿点云
- 数据采集27分钟
- 数据处理30分钟
- 212 米轨迹长度
- 分辨率6 mm

Applications: Tunnel

隧道应用案例



Tunnel Deformation 隧道变形分析

PRODUCTIVITY

—— 谢 谢 ——

